REMARKS

This RCE was filed in response to a final rejection in which Claims 1-24 where rejected under 35 U.S.C. §§ 102(b) or 103 primarily in view of Eng (U.S. Patent No. 4,310,719). These rejections are respectfully traversed. As will be shown, the cited Eng patent neither anticipates nor makes obvious, in view of the other cited prior art patents, the inventive subject matter set forth in the pending claims.

The present invention is directed to a power cable particularly adapted for use with water and air cooled welding torches. Applicant's cable assembly represents an improvement over the prior art cables in that it provides more efficient dissipation of the heat in the cable conductor, improves the carrying capacity of the conductor and substantially reduces hydrogen embrittlement which leads to the splintering of the copper wire, clogging of the fluid flow outlets and often cable failure.

Applicant obtains these results by substantially encasing the electric conductor in a thin layer of flexible plastic material that defines a plurality of radial projections extending radially therefrom so as to abut the interior wall of the outer flexible hose or conduit and thus centrally position the conductive cable within the outer flexible hose or conduit. By centering the conductor within the outer flexible conduit, the projections define unobstructed fluid flow paths that completely surround the conductor so as to more effectively dissipate the heat generated by the

conductor. By making the encasing layer quite thin, on the nature of about 0.010 in. in thickness, the encasing layer has a minimal insulating effect on the wire cable so as not to adversely impact the effectiveness and efficiency of the cooling fluid. The encasement also isolates the cable from the water in water cooled torch applications, significantly reducing hydrogen embrittlement of the individual copper wires. Thus, the "whiskering" or breaking off of frayed splinters of copper wire that result from hydrogen embrittling, is substantially reduced. Any splintering that does occur is retained by the plastic casing, preventing blockage at the end of the cable fitting. The result is a substantial improvement over the prior art and one which is not obtained by the cited Eng patent upon which the pending claims were rejected.

The cited Eng patent teaches a configuration in which a spacer formed of a porous material and having a plurality of radial projections is positioned within an outer flexible hose. The radial projections defined by the Eng spacer do not collectively abut the inner walls of the outer flexible hose but periodically engage a spiral rib or ridge formed on the inner surface of the outer hose to centrally position the spacer within the flexible hose. A first electrical cable conductor 2 is provided within a centrally disposed annular space defined by the spacer. That space (see reference numeral 9) is circular in configuration and defines a diameter larger than the transverse dimension of the cable so as to accommodate cooling water flow therethrough. A second group of electrical conductors (7) is provided in the areas

between the radial projectors formed by the spacers as seen in Figure 1 of Eng. The second group of conductors is for current in the opposition direction (see Eng, col. 1, lines 38-40). The transverse dimension of the spacer is less than the inner diameter of the outer flexible hose so as to provide a space (10) between the outer flexible hose and spacer (5) to accommodate cooling water flow about the second collection of conductors (7). Finally, the body (5) of the spacer is constructed of a porously joined textile material, like a warp knit sheath so that the coolant can flow through the textile body both longitudinally and transversely between the spaces (9) and (10). If one were to eliminate the second collection of conductors (7) so that the Eng device would be more similar to Applicant's structure (*i.e.*, one having a single centrally disposed cable conductor), the device would still not obtain the results achieved by Applicant.

As can be seen in Figure 1, there is nothing in the Eng structure to center the electrical cable conductor (2) within the body of the spacer (5). Accordingly, the connector will rest against one side of the interior surface of the spacer just as in other prior art power cables, the electrical conductor rests against one side of the outer hose. The result is substantially the same. One side of the conductor is occluded from the cooling water flow and the result is uneven heating.

In the Eng construction, the electrical conductor (2) also is not encapsulated or encased as claimed. It is covered by the spacer but the spacer does not encapsulate the connector, quite the opposite. The spacer provides an area (9)

through which cooling water is directed. Accordingly, hydrogen embrittlement will result as in the other prior art cables discussed in the application. The improvement of the current carrying capacity of the copper cable which was found to result when the cable wires were encapsulated with a thin coating of plastic also would likely not result from the Eng structure as there is no encapsulation. At the very least, hydrogen embrittlement will result. The frayed splinters will break off of cable conductor (2) and clog the end of the Eng cable just as occurs in conventional cables. Accordingly, while the Eng device does, at first glance, look quite similar to Applicant's cable, it in fact is very different and does not obtain the advantages of Applicant's novel power cable.

In addition to the differences set forth above, the construction of the Eng device would clearly be more expensive to produce in view of the need for the spiral rib form ridge (1a) formed along the interior of the outer flexible hose (1) to center the spacer. Thus, the cited reference not only fails to obtain the advantages of Applicant's device, it would be more expensive to produce.

Each of the claims in the application contain as an element thereof a layer of flexible material that substantially encases the conductor. As described in the specification, the purpose of that layer is not only to contain fraying copper wire but to prevent hydrogen embrittlement which creates the fraying wire. The sheath accomplishes this task by isolating the wire from the water flow. The spacer in the cited Eng reference, while covering, does not substantially encase the wire as

claimed. Quite to the contrary, it is spaced from the cable wires so as to form a water flow channel about the wires. Without encapsulating the electrical conductor as claimed, the Eng patent certainly cannot anticipate the subject matter of the claims. Inasmuch as none of the cited references teach such encasement, it is respectfully submitted that none of those claims are made obvious by the cited art.

All of the claims in the application also recite that the projections on the encasing layer define a fluid (water, gas or air) flow path that extends along the conduit and surrounds the conductor for the effective dissipation of heat in the conductor. As notes above, the projections on the spacer in the Eng patent do not provide such a path. The relevant conductor (2) in the Eng patent is the centrally disposed conductor positioned in the central area formed by the spacer. Obviously, that conductor does not float in the center of the spacer as illustrated in Figure 1. During use, that conductor lies against the interior sidewall of the spacer. Thus, the water flow path about that conductor would not entirely surround the conductor. The spacer is centered, the cable is not. As a result, the flow path is occluded substantially along the entire length of the cable where the conductor abuts the interior wall of the spacer. Further, that flow path is not created by the radial projections on the spacer as claimed but by the enlarged central opening through the spacer.

Claims 2, 4, 6, 8-10, 12, 14, 16, 18, 19, 23 and 24 additionally recite that the layer of flexible material that substantially encases the conductor has a thickness within the range of about .008-.015 inches. The thin wall of the flexible material allows the encasing layer to readily transmit heat therethrough while separating the conductor from the cooling fluid to prevent hydrogen embrittlement. A thicker encasement would insulate the conductor from the cooling fluid and adversely affect the cooling efficiency of the cooling fluid. As a result of the efficiency of Applicant's cable assembly in dissipating heat, a smaller diameter cable conductor can be used, reducing the weight and increasing flexibility of the power cable as is described in the specification. While the exact dimensions of the wall thickness of the Eng spacer are not set forth in his patent, the relative dimensions illustrated in Figure 1 indicate that the spacer in the Eng reference is substantially outside the claimed thickness of Applicant's flexible encasing layer.

For all of the reasons set forth above, the Eng device does not teach or suggest the elements recited in the claims of the pending application. As discussed in the previously filed Amendment, those elements are also not found in the other art of record. Accordingly, it is respectfully requested that the Examiner reconsider his rejection of the pending claims. It is respectfully submitted that upon such

reconsideration, the differences between the subject matter therein and the cited references will be readily apparent.

Respectfully submitted,

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